Indirect Precursors of Perfluorobutanesulfonate (PFBS): Human health tier II assessment

13 February 2015

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Chemicals in this assessment

Chemical Name in the Inventory	CAS Number
2-Propenoic acid, 2-[ethyl[(nonafluorobutyl)sulfonyl]amino]ethyl ester	17329-79-2
1-Butanesulfonamide, N-ethyl-1,1,2,2,3,3,4,4,4-nonafluoro-N-(2-hydroxyethyl)-	34449-89-3
1-Butanesulfonamide, 1,1,2,2,3,3,4,4,4-nonafluoro-N-(2-hydroxyethyl)-N-methyl-	34454-97-2
1-Butanesulfonamide, 1,1,2,2,3,3,4,4,4-nonafluoro-N,N-bis(2-hydroxyethyl)-	34455-00-0
1-Propanaminium, N,N,N-trimethyl-3-[[(nonafluorobutyl)sulfonyl]amino]-, chloride	53518-00-6
1-Butanesulfonamide, N-[3-(dimethylamino)propyl]-1,1,2,2,3,3,4,4,4-nonafluoro-, monohydrochloride	68957-59-5
Glycine, N-ethyl-N-[(nonafluorobutyl)sulfonyl]-, potassium salt	67584-51-4

Chemical Name in the Inventory	CAS Number
Ethanol, 2-[ethyl[(1,1,2,2,3,3,4,4,4-nonafluorobutyl)sulfonyl]amino]-, dihydrogen phosphate (ester)	67939-89-3
1-Propanaminium, N,N,N-trimethyl-3-[[(nonafluorobutyl)sulfonyl]amino]-, iodide	67939-95-1
Poly(oxy-1,2-ethanediyl), .alpha.-[2-[ethyl[(nonafluorobutyl)sulfonyl]amino]ethyl]-.omega.-hydroxy-	68298-79-3
Poly[oxy(methyl-1,2-ethanediyl)], .alpha.-[2-[ethyl[(nonafluorobutyl)sulfonyl]amino]ethyl]-.omega.-hydroxy-	68310-18-9
Benzoic acid, 2,3,4,5-tetrachloro-6-[[[3-[[(nonafluorobutyl)sulfonyl]oxy]phenyl]amino]carbonyl]-, monopotassium salt	68568-54-7
Chromium, diaquatetrachloro[.mu.-[N-ethyl-N-[(nonafluorobutyl)sulfonyl]glycinato-O1:O1']]-.mu.-hydroxybis[2-propanol]di-	68900-97-0

Preface

This assessment was carried out by staff of the National Industrial Chemicals Notification and Assessment Scheme (NICNAS) using the Inventory Multi-tiered Assessment and Prioritisation (IMAP) framework.

The IMAP framework addresses the human health and environmental impacts of previously unassessed industrial chemicals listed on the Australian Inventory of Chemical Substances (the Inventory).

The framework was developed with significant input from stakeholders and provides a more rapid, flexible and transparent approach for the assessment of chemicals listed on the Inventory.

Stage One of the implementation of this framework, which lasted four years from 1 July 2012, examined 3000 chemicals meeting characteristics identified by stakeholders as needing priority assessment. This included chemicals for which NICNAS already held exposure information, chemicals identified as a concern or for which regulatory action had been taken overseas, and chemicals detected in international studies analysing chemicals present in babies' umbilical cord blood.

Stage Two of IMAP began in July 2016. We are continuing to assess chemicals on the Inventory, including chemicals identified as a concern for which action has been taken overseas and chemicals that can be rapidly identified and assessed by using Stage One information. We are also continuing to publish information for chemicals on the Inventory that pose a low risk to human health or the environment or both. This work provides efficiencies and enables us to identify higher risk chemicals requiring assessment.

The IMAP framework is a science and risk-based model designed to align the assessment effort with the human health and environmental impacts of chemicals. It has three tiers of assessment, with the assessment effort increasing with each tier. The Tier I assessment is a high throughput approach using tabulated electronic data. The Tier II assessment is an evaluation of risk on a substance-by-substance or chemical category-by-category basis. Tier III assessments are conducted to address specific concerns that could not be resolved during the Tier II assessment.

These assessments are carried out by staff employed by the Australian Government Department of Health and the Australian Government Department of the Environment and Energy. The human health and environment risk assessments are conducted and published separately, using information available at the time, and may be undertaken at different tiers.

This chemical or group of chemicals are being assessed at Tier II because the Tier I assessment indicated that it needed further investigation.

For more detail on this program please visit:**www.nicnas.gov.au**

Disclaimer

ACRONYMS & ABBREVIATIONS

Grouping Rationale

The chemicals in this group are structurally related compounds in that they all contain a chain of four perfluorinated carbons linked to a terminal sulfonamide or sulfonic ester group.

The assessment of this group has been conducted in accordance with the NICNAS Action Plan for Assessment and Management of Chemicals which may degrade to Perfluorinated Carboxylic Acids, Perfluoroalkylsulfonates and similar chemicals (the Action Plan). The primary assumption outlined in the Action Plan is that chemicals with a perfluorinated chain terminated by a sulfonyl group will degrade to the perfluoroalkylsulfonate. More information on the plan can be found in Appendix G of the NICNAS Handbook for Notifiers (see NICNASa).

On this basis, the chemicals in this group are considered to have the potential to release the environmentally persistent perfluorobutanesulfonate (PFBS) anion via biodegradation and, therefore, are considered to be PFBS precursors.

PFBS based chemicals were introduced as alternatives to the longer chain perfluoroalkyl sulfonates (PFAS) (containing carbon chain lengths of 6 or higher) including substances which may be a source of the hazardous perfluorooctanesulfonate (PFOS) anion in the environment (UNEP, 2013). As the critical health concerns for the longer chain PFAS chemicals are bioaccumulation potential and systemic long term effects (NICNASb), the focus of this assessment for the shorter chain PFBS chemicals will be on their potential for similar long term effects. Data for acute and local effects have been included where available.

The degradation of PFBS is very slow compared with its rate of formation from degradation of the precursors and PFBS will be the final degradant from multiple precursors. Therefore, the amounts of the PFBS in the environment (general or local) is expected to be higher than that of any of the precursors. Whilst polymeric precursors generally do not present significant risks while in polymeric form, direct exposure to small molecule precursors, such as those in this assessment, may pose health risks. However, these are generally used in small volume and/or low concentrations in Australia (see **Australian Import, Manufacture and Use** section). Consequently, the most important health risk is expected to arise from secondary exposure to PFBS. As such, the focus of this assessment is on the long term effects of the chemicals due to the degradation of the chemicals to PFBS. Acute and local effects have not been considered.

Import, Manufacture and Use

Australian

The 3M company is the primary producer of substances based on PFBS technology internationally (Poulsen, et al., 2005; UNEP, 2013). Based on the available information, only one of these chemicals is currently used in one specific application (specialised printing ink) at very low volumes (less than 1 kg per annum).

Information collected under NICNAS in 2005 indicated that no PFBS derivatives were manufactured in Australia (NICNAS, 2005).

It is noted that the chemicals in this group may be present in the environment due to historic use, or due to release from articles or the use of chemicals not covered by this assessment.

International

Some of the chemicals in this group (CAS Nos. 34454-97-2, 67584-51-4, 67939-95-1, 68298-79-3, 68310-18-9 and 68900-97-0)) are used as surfactants. No other specific uses were identified (Galleria Chemica).

The use of PFBS derivatives as an alternative to the use of PFOS has been identified for the following uses (Poulsen et al. 2005; UNEP, 2013):

- impregnation of textiles, leather and carpets;
- industrial and commercial cleaning products;
- surface coatings, paints and varnishes;
- oil production and mining;
- semiconductor industry; and
- electroplating.

These uses are considered potentially relevant to the chemicals in this group.

Use data available for Nordic countries indicate that N-MeFBSE alcohol, potassium N-EtFBSA acetate and the quaternary ammonium iodide salt (CAS RN 67939-95-1) were in use in Denmark in 2012. Additionally, PEG N-EtFBSE was used in Denmark in 2011. Other chemicals in this group were used in preceding years. Identified uses include surface treatment and as a surface-active agent and cleaning agent (SPIN).

All chemicals in this group, except PPG N-EtFBSE (CAS No. 68310-18-9), are pre-registered under the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) legislation. None of these chemicals are registered under the REACH legislation.

No evidence of the presence of these chemicals in consumer products was found in available North American databases, indicating that the chemicals are not likely to be widely available for domestic uses.

Restrictions

Australian

No known restrictions have been identified. However, substances with shorter per- or polyfluorinated carbon chain have been developed as a strategy to replace long chain alkyl substances.

International

No known restrictions have been identified.

Existing Worker Health and Safety Controls

Hazard Classification

The chemicals are not listed on the Hazardous Substances Information System (HSIS) (Safe Work Australia).

Exposure Standards

Australian

No specific exposure standards are available.

International

No specific exposure standards are available.

Health Hazard Information

No data are available for the chemicals in this group. The chemicals in this group are assumed to degrade to PFBS. The primary health risk for the chemicals in this group is expected to arise from secondary exposure to PFBS (see **Grouping Rationale** section).

PFBS was shown to actively bind to human albumin protein in serum. Apparent saturation of the binding above 100 ppm in rat, human and monkey serum was observed in this study. In comparison to PFOS, PFBS is eliminated by various species within shorter periods of time. Increased levels of PFBS have been found in blood and serum of humans in some (but not all) countries (NICNASc). No data are available on the levels of PFBS in the Australian population.

PFBS is not considered to be acutely toxic or cause serious damage to health from repeated oral exposure including reproductive or developmental toxicity. It is not considered to be genotoxic. There are no available data on the carcinogenicity of PFBS. Whilst PFOS is classified as hazardous with the risk phrase Carc. Cat 3 - Limited evidence of a carcinogenic effect (Xn; R40) (NICNASb), histopathological changes (both neoplastic and non-neoplastic) observed in 90-day studies with PFOS at the sites of tumour formation were not observed in studies using PFBS (NICNASc).

Risk Characterisation

Critical Health Effects

The focus of this assessment is on the long term effects of the chemicals due to the degradation of the chemicals to PFBS. Acute and local effects (irritation and sensitisation) have not been considered. Whilst polymeric precursors generally do not present significant risks while in polymeric form, direct exposure to small molecule precursors, such as those in this assessment, may pose health risks. However, these are generally used in small volume and/or low concentrations in Australia (see **Australian Import, Manufacture and Use** section). Consequently, the primary health risk is expected to arise from secondary exposure to PFBS.

Data available indicate that PFBS has a more favourable toxicological profile and bioaccumulation potential than long-chain perfluoroalkyl substances. Chronic low level effects on human health have not been identified.

Public Risk Characterisation

Use in consumer products

Based on the available use information, the chemicals are not likely to be available for domestic or cosmetic uses. Hence, the public risk from direct use of these chemicals is not considered to be unreasonable.

Secondary exposure to PFBS via the environment

Public exposure to PFBS could occur through secondary exposure via the environment. It is noted that PFBS has been found to be a highly persistent chemical, and environmental levels may continue to increase over time due to release from various sources.

The scale and time frame of such an increase, and its relevance to characterising the long term environmental risk profile of PFBS, currently remain unknown (NICNASd).

Data available indicate that PFBS has a more favourable toxicological profile and bioaccumulation potential than the long-chain perfluoroalkyl substances. Chronic low level effects on human health have not been identified. Further assessment of the chemicals in this group may be necessary to inform the risk of secondary exposure to PFBS, if:

- information becomes available indicating that these chemicals are introduced into Australia in significant quantities; or
- hazard data become available indicating adverse health effects.

Occupational Risk Characterisation

Based on the available use information, the chemicals are not likely to be used in significant quantities in Australia. Therefore the chemicals are not considered to pose an unreasonable risk to the health of workers.

The chemicals currently have no hazard classification for worker health and safety; this is considered appropriate for systemic long-term effects based on available data. Acute and local effects (irritation and sensitisation) have not been considered.

NICNAS Recommendation

Current risk management measures are considered adequate to protect public and workers' health and safety, provided that all requirements are met under workplace health and safety, and poisons legislation as adopted by the relevant state or territory.

The chemicals are not recommended for classification and labelling under the current approved criteria and adopted GHS. This does not consider classification of acute toxicity, local effects (irritation and sensitisation), physical hazards and environmental hazards.

Further assessment of the chemicals in this group may be necessary to inform the risk of secondary exposure to PFBS, if:

- information becomes available indicating that these chemicals are introduced into Australia in significant quantities; or
- hazard data become available indicating adverse health effects.

Regulatory Control

Advice for industry

Obligations under workplace health and safety legislation

Information in this report should be taken into account to assist with meeting obligations under workplace health and safety legislation as adopted by the relevant state or territory. This includes, but is not limited to:

- ensuring that hazardous chemicals are correctly classified and labelled;
- ensuring that (material) safety data sheets ((m)SDS) containing accurate information about the hazards (relating to both health hazards and physicochemical (physical) hazards) of the chemical are prepared; and
- managing risks arising from storing, handling and using a hazardous chemical.

Your work health and safety regulator should be contacted for information on the work health and safety laws in your jurisdiction. Information on how to prepare an (m)SDS and how to label containers of hazardous chemicals are provided in relevant codes of practice such as the *Preparation of Safety Data Sheets for Hazardous Chemicals— Code of Practice* and *Labelling of Workplace Hazardous Chemicals—Code of Practice*, respectively. These codes of practice are available from the Safe Work Australia website.

A review of the acute toxicity, local effects and physical hazards of the chemicals has not been undertaken as part of this assessment.

References

National Industrial Chemical Notification and Assessment Scheme (NICNASa). Data requirements for notification of new chemical substances containing a perfluorinated carbon chain. Available at **https://www.nicnas.gov.au/notify-your-chemical/data-requirements-for-new-chemical-notifications/data-requirements-for-notification-of-new-chemicals-conta**ining-a-perfluorinated-carbon-chain

National Industrial Chemicals Notification and Assessment Scheme (NICNAS, 2005). Existing Chemicals hazard assessment report on potassium perfluorobutane sulfonate. Available at **http://www.nicnas.gov.au**

National Industrial Chemicals Notification and Assessment Scheme (NICNASb). Tier II human health assessment for Perfluorooctanesulfonate and its direct precursors Australian Government Department of Health. Available at **http://www.nicnas.gov.au**

National Industrial Chemicals Notification and Assessment Scheme (NICNASc). Tier II human health assessment for Perfluorobutanesulfonate and its direct precursors. Australian Government Department of Health. Available at **www.nicnas.gov.au**

National Industrial Chemicals Notification and Assessment Scheme (NICNASd). Tier II environment assessment for Perfluorobutanesulfonate and its direct precursors. Australian Government Department of Health. Available at **www.nicnas.gov.au**

OECD (2013), OECD/UNEP Global PFC Group, Synthesis paper on per- and polyfluorinated chemicals (PFCs), Environment, Health and Safety, Environment Directorate, OECD. Accessed January 2015 at **http://www.oecd.org/env/ehs/risk-management/PFC_FINAL-Web.pdf**

Poulsen PB, et al. (2005). More environmentally friendly alternatives to PFOS-compounds and PFOA. Danish Environmental Protection Agency, Cophenhagen, Denmark. Accessed 21 January 2015 at **http://www2.mst.dk/udgiv/publications/2005/87-7614-668-5/pdf/87-7614-669-3.pdf**.

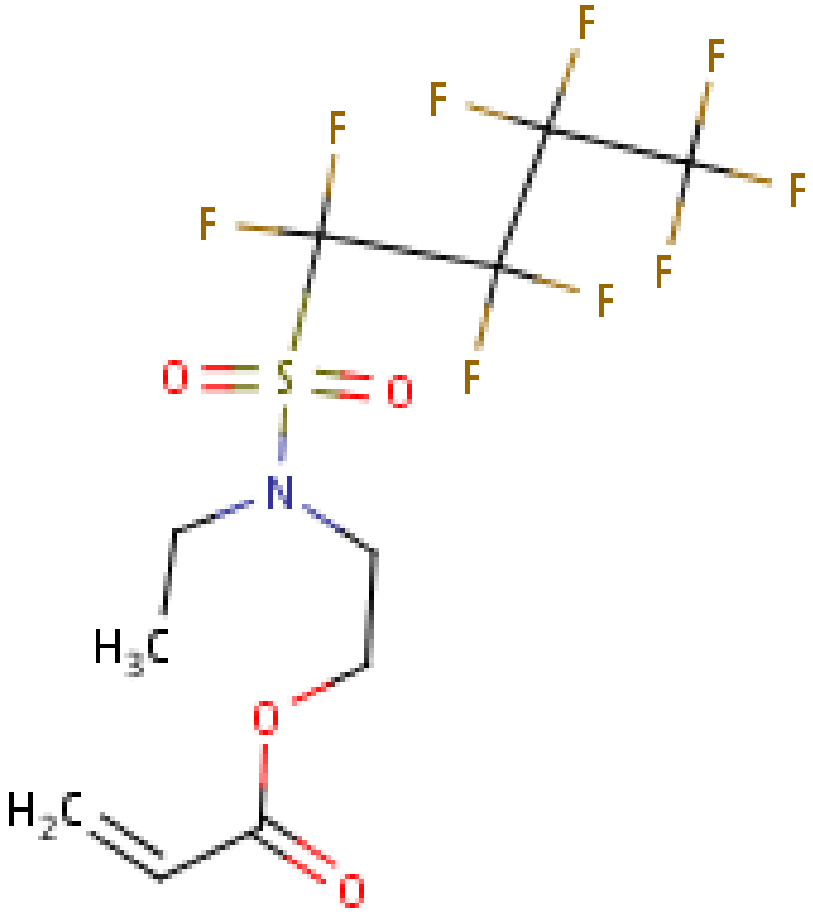
Safe Work Australia (SWA). Hazardous Substances Information system (HSIS). Accessed January 2015 at **http://hsis.safeworkaustralia.gov.au/HazardousSubstance**.

UNEP (2013), Persistent Organic Pollutants Review Committee Working group on guidance on alternatives to perfluorooctane sulfonic acid, its salts, perfluorooctane sulfonyl fluoride and their related chemicals. Guidance on alternatives to perfluorooctane sulfonic acid, its salts, perfluorooctane sulfonyl fluoride and their related chemicals Second revised draft 26 April 2013. Accessed January 2015 at **http://chm.pops.int/Convention/POPsReviewCommittee/LatestMeeting/POPRC8/POPRC8Followup/tabid/2911/Default.aspx**

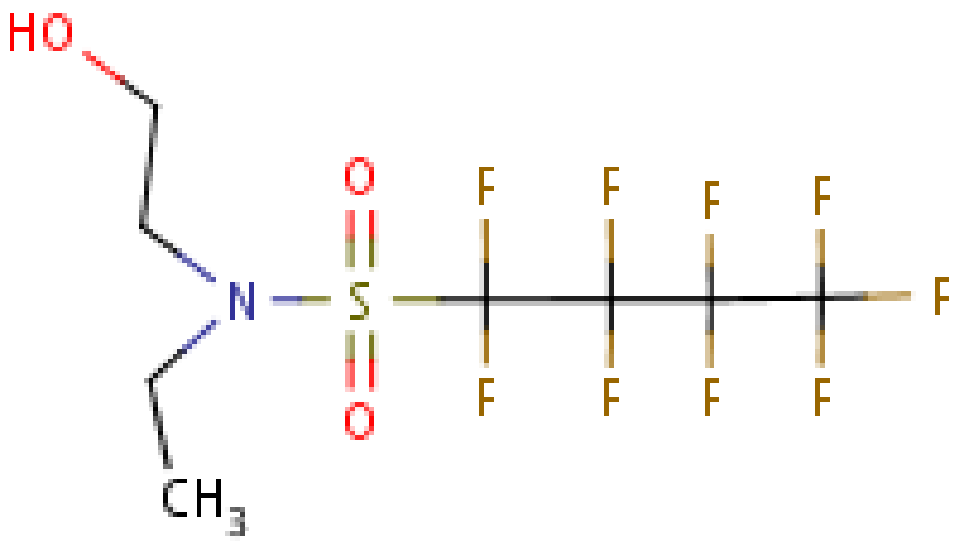
Last Update 13 February 2015

Chemical Identities

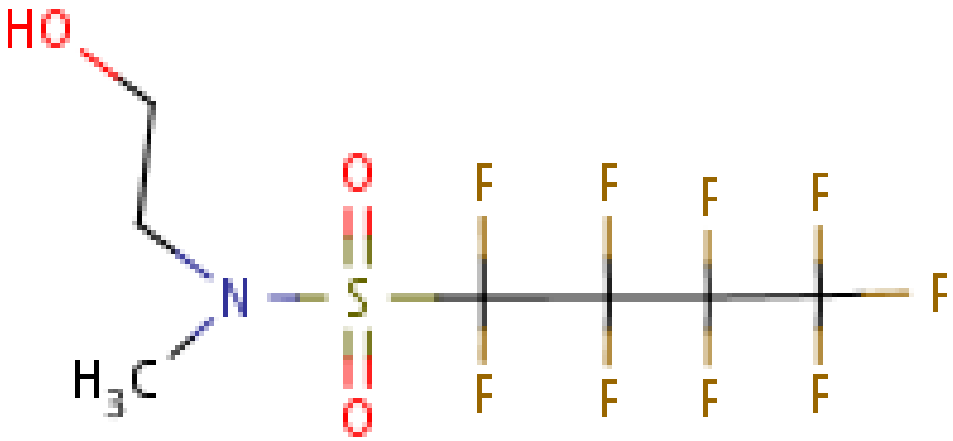
Chemical Name in the Inventory and Synonyms	**2-Propenoic acid, 2-[ethyl[(nonafluorobutyl)sulfonyl]amino]ethyl ester** 2-(ethyl((nonafluorobutyl)sulphonyl)amino)ethyl acrylate 2-propenoic acid, 2-(ethyl((1,1,2,2,3,3,4,4,4-nonafluorobutyl)sulfonyl)amino)ethyl ester N-EtFBSE acrylate N-ethylperfluorobutanesulfonamidoethyl acrylate
CAS Number	17329-79-2
Structural Formula	

	
Molecular Formula	C11H12F9NO4S
Molecular Weight	425.3

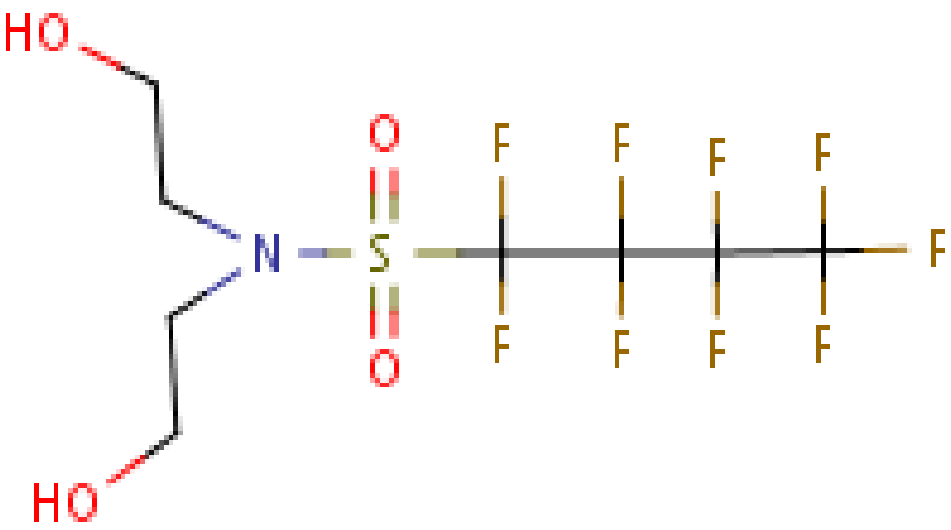
Chemical Name in the Inventory and Synonyms	**1-Butanesulfonamide, N-ethyl-1,1,2,2,3,3,4,4,4-nonafluoro-N-(2-hydroxyethyl)-** N-ethylnonafluoro-N-(2-hydroxymethyl)-1-butanesulfonamide N-ethyl-1,1,2,2,3,3,4,4,4-nonafluoro-N-(2-hydroxyethyl)butane-1-sulphonamide N-EtFBSE alcohol N-Ethylperfluorobutanesulfonamidoethyl alcohol
CAS Number	34449-89-3
Structural Formula	

	
Molecular Formula	C8H10F9NO3S
Molecular Weight	371.2

Chemical Name in the Inventory and Synonyms	**1-Butanesulfonamide, 1,1,2,2,3,3,4,4,4-nonafluoro-N-(2-hydroxyethyl)-N-methyl-** nonafluoro-n-(2-hydroxyethyl)-n-methyl-1-butanesulfonamide N-MeFBSE alcohol N-Methylperfluorobutanesulfonamidoethyl alcohol
CAS Number	34454-97-2
Structural Formula	

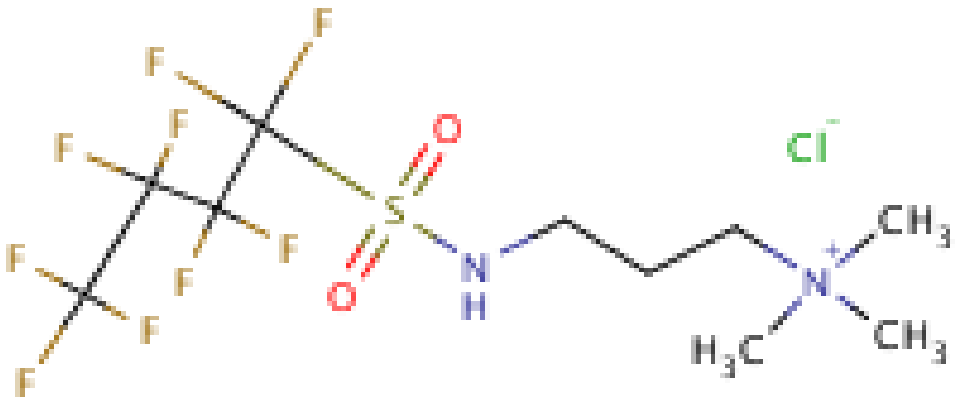
	
Molecular Formula	C7H8F9NO3S
Molecular Weight	357.2

Chemical Name in the Inventory and Synonyms	**1-Butanesulfonamide, 1,1,2,2,3,3,4,4,4-nonafluoro-N,N-bis(2-hydroxyethyl)-** 1,1,2,2,3,3,4,4,4-nonafluoro-N,N-bis(2-hydroxyethyl)butane-1-sulphonamide N-EtFBSE diol N,N-Bis(hydroxyethyl)perfluorobutanesulfonamide
CAS Number	34455-00-0
Structural Formula	

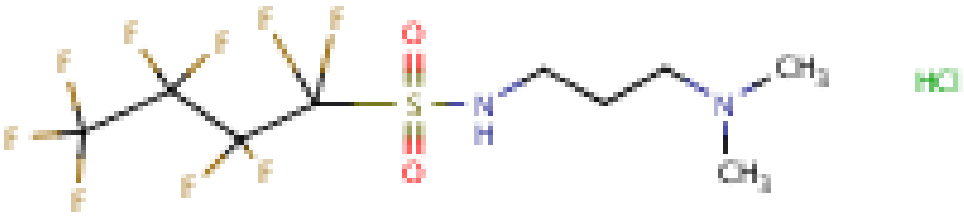


Molecular Formula	C8H10F9NO4S
Molecular Weight	387.2

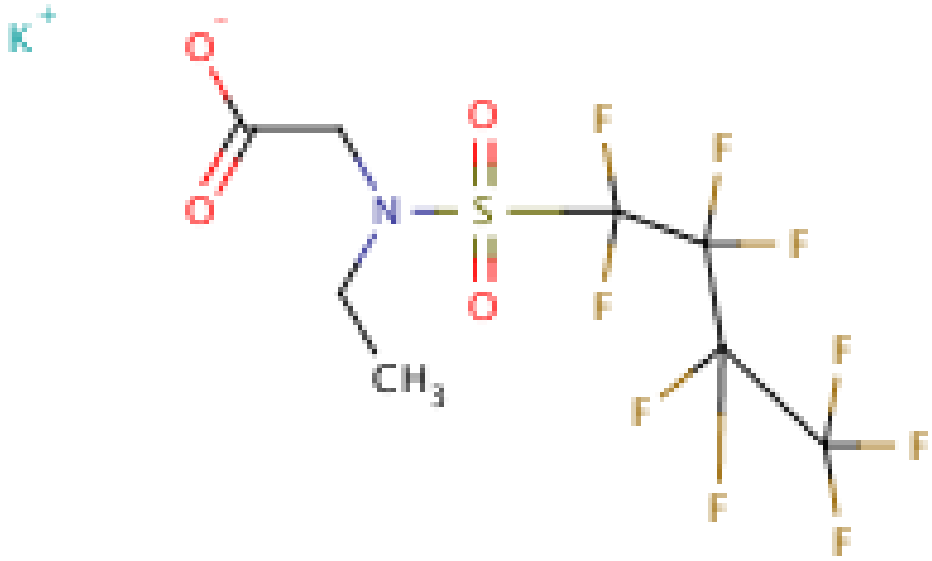
Chemical Name in the Inventory and Synonyms	**1-Propanaminium, N,N,N-trimethyl-3-[[(nonafluorobutyl)sulfonyl]amino]-, chloride** 3-(((nonafluorobutyl)sulfonyl)-amino)-N,N,N-trimethyl-1-propanaminium chloride trimethyl-3-(((nonafluorobutyl)sulphonyl)amino)propylammonium chloride N-(3-(trimethyl)aminopropyl)perfluorobutanesulfonamide chloride
CAS Number	53518-00-6
Structural Formula	

	
Molecular Formula	C10H16F9N2O2S.Cl
Molecular Weight	434.8

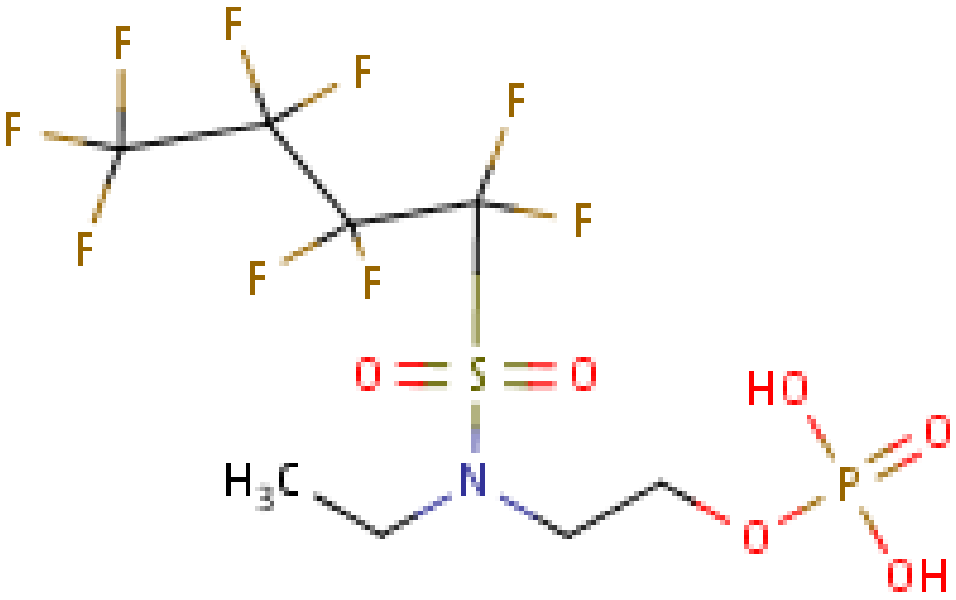
Chemical Name in the Inventory and Synonyms	**1-Butanesulfonamide, N-[3-(dimethylamino)propyl]-1,1,2,2,3,3,4,4,4-nonafluoro-, monohydrochloride** N-(3-(dimethylamino)propyl)-1,1,2,2,3,3,4,4,4-nonafluoro-1-butanesulfonamide, hydrochloride 1-butanesulfonamide, N-(3-(dimethylamino)propyl)-1,1,2,2,3,3,4,4,4-nonafluoro-, hydrochloride (1:1)
CAS Number	68957-59-5
Structural Formula	

	
Molecular Formula	C9H13F9N2O2S.ClH
Molecular Weight	420.7

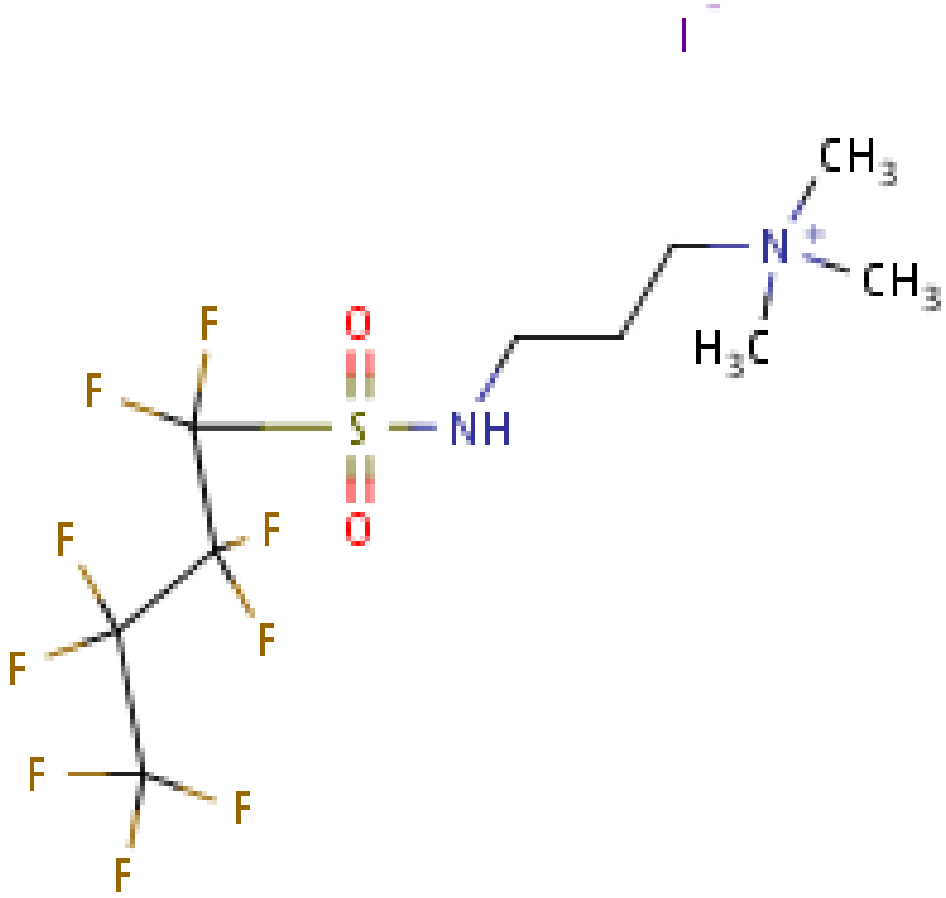
Chemical Name in the Inventory and Synonyms	**Glycine, N-ethyl-N-[(nonafluorobutyl)sulfonyl]-, potassium salt** N-ethyl-N-[(nonafluorobutyl)sulfonylglycine, potassium salt potassium N-ethyl-N-((nonafluorobutyl)sulphonyl)glycinate potassium N-EtFBSA acetate potassium N-ethylperfluorobutanesulfonamide acetate
CAS Number	67584-51-4
Structural Formula	

	
Molecular Formula	C8H8F9NO4S.K
Molecular Weight	423.3

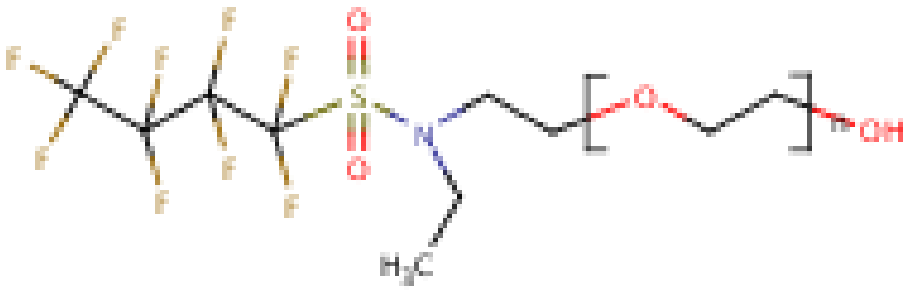
Chemical Name in the Inventory and Synonyms	**Ethanol, 2-[ethyl[(1,1,2,2,3,3,4,4,4-nonafluorobutyl)sulfonyl]amino]-, dihydrogen phosphate (ester)** N-ethyl-1,1,2,2,3,3,4,4,4-nonafluoro-N-[2-(phosphonooxy)ethyl)-1-butanesulfonamide 1-butanesulfonamide, N-ethyl-1,1,2,2,3,3,4,4,4-nonafluoro-N-(2-(phosphonooxy)ethyl)- N-EtFBSE phosphate N-Ethylperfluorobutanesulfonamidoethyl phosphate
CAS Number	67939-89-3
Structural Formula	

	
Molecular Formula	C8H11F9NO6PS
Molecular Weight	451.2

Chemical Name in the Inventory and Synonyms	**1-Propanaminium, N,N,N-trimethyl-3-[[(nonafluorobutyl)sulfonyl]amino]-, iodide** 3-(((nonafluorobutyl)sulfonyl)amino)-N,N,N-trimethyl-1-propanaminium iodide trimethyl-3-(((nonafluorobutyl)sulphonyl)amino)propylammonium iodide N-(3-(trimethyl)aminopropyl)perfluorobutanesulfonamide iodide
CAS Number	67939-95-1
Structural Formula	

	
Molecular Formula	C10H16F9N2O2S.I
Molecular Weight	526.2

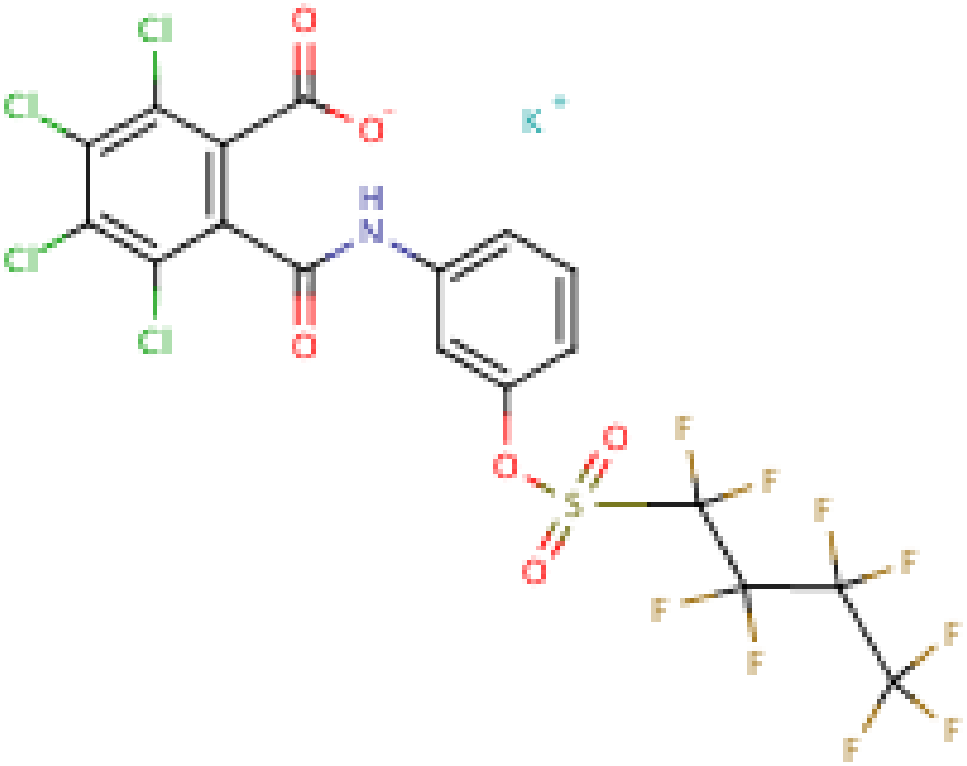
Chemical Name in the Inventory and Synonyms	**Poly(oxy-1,2-ethanediyl), .alpha.-[2-[ethyl[(nonafluorobutyl)sulfonyl]amino]ethyl]-.omega.-hydroxy-** alpha-(2-(ethyl((nonafluorobutyl)sulfonyl)amino)ethyl)-omega-hydroxy poly(oxy-1,2-ethanediyl) polyethylene glycol N-ethylperfluorobutanesulfonamide PEG N-EtFBSE
CAS Number	68298-79-3
Structural Formula	

	
Molecular Formula	(C2H4O)nC8H10F9NO3S
Molecular Weight	

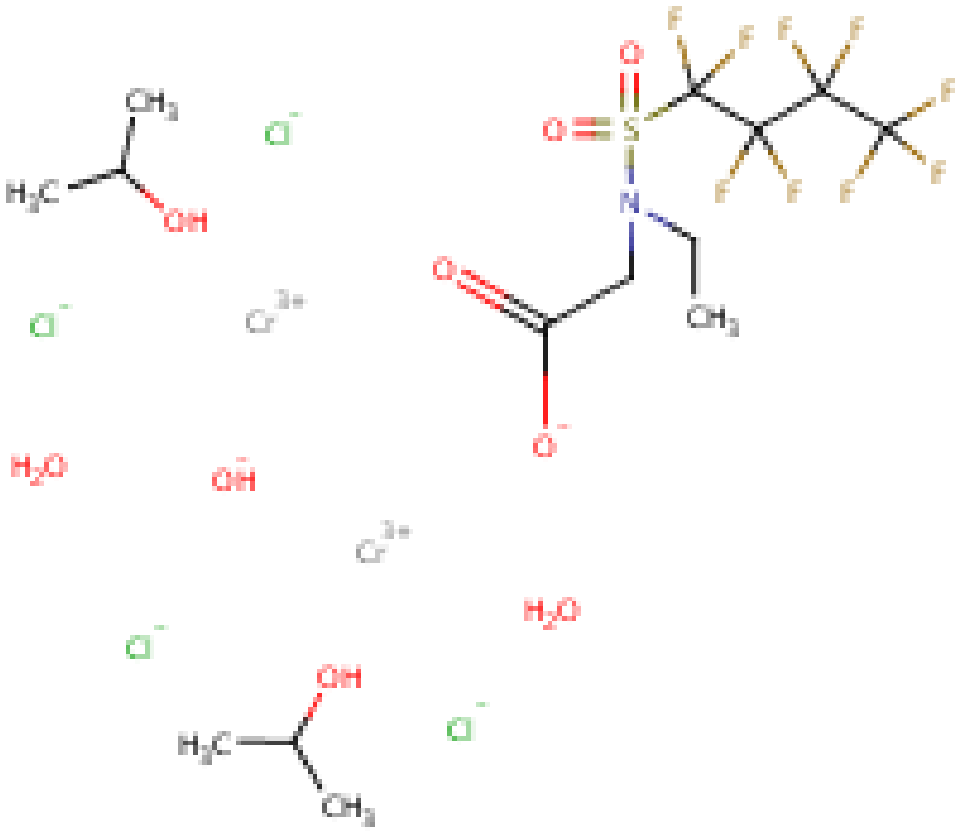
Chemical Name in the Inventory and Synonyms	**Poly[oxy(methyl-1,2-ethanediyl)], .alpha.-[2-[ethyl[(nonafluorobutyl)sulfonyl]amino]ethyl]-.omega.-hydroxy-** poly(oxy(methyl-1,2-ethanediyl)), alpha-(2-(ethyl((1,1,2,2,3,3,4,4,4-nonafluorobutyl)sulfonyl)amino)ethyl)-omega-hydroxy- polypropylene glycol N-ethylperfluorobutanesulfonamide PPG N-EtFBSE
CAS Number	68310-18-9
Structural Formula	

	No Structural Diagram Available
Molecular Formula	(C3H6O)nC8H10F9NO3S
Molecular Weight	

Chemical Name in the Inventory and Synonyms	**Benzoic acid, 2,3,4,5-tetrachloro-6-[[[3-[[(nonafluorobutyl)sulfonyl]oxy]phenyl]amino]carbonyl]-, monopotassium salt** 2,3,4,5-tetrachloro-6-((3-(nonafluorobutyl)sulfonyloxy)phenylaminocarbonyl)benzoic acid, potassium salt benzoic acid, 2,3,4,5-tetrachloro-6-(((3-(((1,1,2,2,3,3,4,4,4-nonafluorobutyl)sulfonyl)oxy)phenyl)amino)carbonyl)-, potassium salt (1:1)
CAS Number	68568-54-7
Structural Formula	

	
Molecular Formula	C18H6Cl4F9NO6S.K
Molecular Weight	715.2

Chemical Name in the Inventory and Synonyms	**Chromium, diaquatetrachloro[.mu.-[N-ethyl-N-[(nonafluorobutyl)sulfonyl]glycinato-O1:O1']]-.mu.-hydroxybis[2-propanol]di-** chromium, diaquatetrachloro(mu-(N-ethyl-N-((1,1,2,2,3,3,4,4,4-nonafluorobutyl)sulfonyl)glycinato-kappaO:kappaO'))-mu-hydroxybis(2-propanol)di- chromium, diaquatetrachloro(mu-(N-ethyl-N-((nonafluorobutyl)sulfonyl)glycinato-kappaO:kappaO'))-mu-hydroxybis(2-propanol)di- N-ethylperfluorobutanesulfonylethyl acetate chromium complex N-EtFBSE acetate chromium complex
CAS Number	68900-97-0
Structural Formula	

	
Molecular Formula	C14H28Cl4Cr2F9NO9S
Molecular Weight	803.2

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